

**PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Timothy L. HOOPMAN et al. ) Group Art Unit: 1722  
Serial No.: 09/955,604 )  
Confirmation No.: 1214 ) Examiner: Joseph Leyson  
Filed: 19 September 2001 )  
For: TOOLS TO MANUFACTURE ABRASIVE ARTICLES

## **AMENDMENT AND RESPONSE**

**Assistant Commissioner for Patents  
Washington D.C. 20231**

Dear Sir:

In response to the Office Action mailed 30 January 2002, please amend the above-identified application as follows:

### In the Specification

Please replace the paragraph beginning at page 1, line 7, with the following rewritten paragraph. Per 37 C.F.R. § 1.121, this paragraph is also shown in Appendix A with notations to indicate the changes made.

-- This application is a continuation of Application No. 09/520,032 (filed March 6, 2000), pending, which is a division of Application No. 09/259,488 (filed February 26, 1999), issued as U.S. Patent NO. 6,076,248, which application is a division of Application No. 08/940,267 (filed September 29, 1997), issued as U.S. Patent No. 6,129,540, which is a continuation of Application No. 08/450,814 (filed May 25, 1995), abandoned, which is a division of Application No. 08/120,300 (filed September 13, 1993), abandoned. --

**In the Claims**

Please amend claims 23, 24, 30-32, 56, 57, 63, 64, 92, 93, 113, 114, 136, 143, and 151-153. The amended claims are provided below in clean form. Per 37 C.F.R. § 1.121, amended claims are also shown in Appendix A with notations to indicate changes made (for convenience, all pending claims are provided in Appendix A).

23. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, and the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second and third plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first and third plurality of angles, and wherein each of the cavities has a single opening.

24. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape and fourth plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second, third, and fourth plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first, third, and fourth plurality of angles, wherein at least one of the angles of the third plurality is different from all of the angles of the first, second, and fourth plurality of angles, and wherein at least one of the angles of the fourth plurality is different from all of the angles of the first, second, and third plurality of angles.

the third plurality is different from all of the angles of the first, second, and fourth plurality of angles, and wherein each of the cavities has a single opening.

30. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defining at least a first, a second, and a third group, wherein a first group of cavities has a first shape, a second group of cavities has a second shape, a third group of cavities has a third shape, wherein the first, second, and third shapes are all different, and wherein each of the cavities has a single opening.

31. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defining at least a first, a second, and a third group, wherein a first group of cavities has a first size, a second group of cavities has a second size, a third group of cavities has a third size, wherein the first, second, and third sizes are all different, and wherein each of the cavities has a single opening.

32. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defined by substantially distinct and discernible boundaries which include substantially specific dimensions, wherein a first cavity has specific first dimensions, a second cavity has specific second dimensions, and a third cavity has specific third dimensions, each of said cavities has a boundary defined by at least four planar surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein at least one angle of intersection of said first cavity is different from all the angles of intersection of said second and third cavities, wherein at least one angle of intersection of said second cavity is different from all the angles of intersection of said first and third cavities, and wherein each of the cavities has a single opening.

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**56. (Amended) A method of making a production tool, the method comprising:**

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, and the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second and third plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first and third plurality of angles, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

**57. (Amended) A method of making a production tool, the method comprising:**

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape and fourth plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second, third, and fourth plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first, third, and fourth plurality of angles, wherein at least one of the angles of the third plurality is different from all of the angles of the first, second, and fourth plurality of angles, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

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63. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a plurality of cavities defining at least a first, a second group, and a third group, wherein a first group of cavities has a first shape, a second group of cavities has a second shape, a third group of cavities has a third shape, wherein the first, second, and third shapes are all different, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

64. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a plurality of cavities defining at least a first, a second group, and a third group, wherein a first group of cavities has a first size, a second group of cavities has a second size, a third group of cavities has a third size, wherein the first, second, and third sizes are all different, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

92. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, and the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening.

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93. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape including a base and fourth plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths, and wherein each of the cavities has a single opening.

113. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, and the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, wherein at least one of the base edge lengths of the second

plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

**114. (Amended) A method of making a production tool, the method comprising:**

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape including a base and fourth plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

**136. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third row of cavities, wherein the cavities each have a geometric shape including a base and a plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first row of cavities is different from all the base edge lengths of the second and third rows of cavities, wherein at least one of the base edge lengths of**

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the second row of cavities is different from all the base edge lengths of the first and third row of cavities, and wherein each of the cavities has a single opening.

143. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising first, second, and third cavities, wherein the first cavity has a first geometric shape including a base and a first plurality of base edge lengths forming the base of the geometric shape, the second cavity has a second geometric shape including a base and a second plurality of base edge lengths forming the base of the geometric shape, and the third cavity has a third geometric shape including a base and a third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality of base edge lengths is different from all the base edge lengths of the second and third plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality of base edge lengths is different from all the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening.

151. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a plurality of cavities defined by substantially distinct and discernible boundaries which include substantially specific dimensions, wherein a first cavity has specific first dimensions, a second cavity has specific second dimensions, and a third cavity has specific third dimensions, each of said cavities has a boundary defined by at least four planar surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein at least one angle of intersection of said first cavity is different from all the angles of intersection of said second and third cavities, wherein at least one angle of intersection of said second cavity is different from all the angles of intersection of said first and third cavities, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

152. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, and third row of cavities, wherein the cavities each have a geometric shape including a base and a plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first row of cavities is different from all the base edge lengths of the second and third rows of cavities, wherein at least one of the base edge lengths of the second row of cavities is different from all the base edge lengths of the first and third row of cavities, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

153. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising first, second, and third cavities, wherein the first cavity has a first geometric shape including a base and a first plurality of base edge lengths forming the base of the geometric shape, the second cavity has a second geometric shape including a base and a second plurality of base edge lengths forming the base of the geometric shape, and the third cavity has a third geometric shape including a base and a third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality of base edge lengths is different from all the base edge lengths of the second and third plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality of base edge lengths is different from all the base edge lengths of the first and third plurality of base edge lengths, and wherein each of the cavities has a single opening; and

forming the production tool using the design.

**Remarks**

The Office Action mailed 30 January 2002 has been received and reviewed. Claims 23, 24, 30-32, 56, 57, 63, 64, 92, 93, 113, 114, 136, 143, and 151-153 have been amended. The pending claims are claims 23-24, 30-32, 56-57, 63-64, 89-90, 92-93, 113-114, and 133-153. Reconsideration and withdrawal of the rejections are respectfully requested.

Pursuant to the Examiner's request, the specification has been amended herein to correctly identify the cross reference information.

**Response to Restriction Requirement**

Pursuant to the telephone conversation between the Examiner and Applicants' Representative, Ann Mueting, election of Group I (claims 23, 24, 30-32, 89, 90, 92, 93, and 133-148) is hereby affirmed.

Applicants' Representatives reserve the right to pursue examination of the non-elected claims in continuation or divisional applications. Applicants respectfully request reconsideration of the restrictions in this case and submit that the inventions as claimed can be readily evaluated in one search without placing undue burden on the Examiner.

**The 35 U.S.C. § 102(b) Rejection**

Claims 23, 30-31, 89, 92, and 133-148 were rejected under 35 U.S.C. § 102(b) as being anticipated by Rochlis ('583). Applicants respectfully traverse this rejection.

Each of the independent claims recites that each of the cavities has a single opening. In contrast, the mold disclosed in Rochlis ('583) requires a laminate construction with multiple openings (i.e., one opening per layer). Specifically, these openings between the mating surfaces of the laminations allow that "air or gas evolved in the molding or hardening procedure may escape" (col. 13, lines 70-73). There is no enabling disclosure in Rochlis ('583), however, that any cavity, let alone each of the cavities, has a single opening. That is, there is no enabling

disclosure that Rochlis ('583) has laminated mold constructions without openings between the mating surfaces of the laminations.

For at least the above reasons, Applicants submit that claims 23, 30-31, 89, 92, and 133-148 are patentable over Rochlis ('583). Reconsideration and withdrawal of the rejection are, therefore, respectfully requested.

#### **The 35 U.S.C. § 103(a) Rejection**

Claims 23-24, 31-32, 89-90, 92-93, and 133-148 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Rochlis ('583). Applicants respectfully traverse this rejection.

Again, each of the independent claims recites that each of the cavities has a single opening. In contrast, the mold disclosed in Rochlis ('583) requires a laminate construction with multiple openings (i.e., one opening per layer). Specifically, these openings between the mating surfaces of the laminations allow that "air or gas evolved in the molding or hardening procedure may escape" (col. 13, lines 70-73). There is no enabling disclosure in Rochlis ('583), however, that any cavity, let alone each of the cavities, has a single opening. That is, there is no enabling disclosure that Rochlis ('583) has laminated mold constructions without openings between the mating surfaces of the laminations.

For at least the above reasons, claims 23-24, 31-32, 89-90, 92-93, and 133-148 are patentable over Rochlis ('583). Reconsideration and withdrawal of this rejection are, therefore, respectfully requested.

#### **Double Patenting Rejection**

Claims 23-24, 30-32, 89-90, 92-93, and 133-148 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 17, 20-21, 25-28, 33-54, 94-96, and 98-111 of copending Application No. 09/520,032. Upon an indication of otherwise allowable subject matter and in the event this rejection is maintained, Applicants will provide an appropriate response.

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**Summary**

It is respectfully submitted that the pending claims are in condition for allowance and notification to that effect is respectfully requested. The Examiner is invited to contact Applicants' Representatives, at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted for  
HOOPMAN et al.

By:

Muetting, Raasch & Gebhardt, P.A.  
P.O. Box 581415  
Minneapolis, MN 55458-1415  
Phone: (612) 305-1220  
Facsimile: (612) 305-1228

By:

*Ann M. Muetting*

Ann M. Muetting  
Reg. No. 33,977  
Direct Dial (612)305-1217

Date

AMM/kjm

**CERTIFICATE UNDER 37 CFR §1.8:**

The undersigned hereby certifies that this paper is being transmitted by facsimile in accordance with 37 CFR §1.6(d) to the Patent and Trademark Office, addressed to Assistant Commissioner for Patents, Washington, D.C. 20231, on this 30<sup>th</sup> day of APRIL, 2002, at 3:10 pm (Central Time).

By:

Printed Name:

*Kelly J. McNulty*

*Kelly J. McNulty*

**APPENDIX A - SPECIFICATION/CLAIM AMENDMENTS INCLUDING NOTATIONS  
TO INDICATE CHANGES MADE**

**Serial No.: 09/955,604  
Docket No.: 49933 US 032**

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Amendments to the following are indicated by underlining what has been added and bracketing what has been deleted. The amendments have also been shaded.

**In the Specification**

The paragraph beginning at page 1, line 7, has been replaced with the following paragraph:

[REDACTED] (REPLACES THE PARENTAL APPLICATION NUMBER 09/955,604)  
[REDACTED] (REPLACES THE PARENTAL APPLICATION NUMBER 09/955,604)

**In the Claims**

For convenience, all pending claims are shown below.

23. **(Amended)** A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, and the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second and third plurality of angles, [REDACTED] wherein at least one of the angles of the second plurality is different from all of the angles of the first and third plurality of angles [REDACTED] and wherein each of the cavities has a single opening.

24. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape and fourth plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second, third, and fourth plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first, third, and fourth plurality of angles, [REDACTED] wherein at least one of the angles of the third plurality is different from all of the angles of the first, second, and fourth plurality of angles, [REDACTED] and wherein each of the cavities has a single opening.

30. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defining at least a first, a second, and a third group, wherein a first group of cavities has a first shape, a second group of cavities has a second shape, a third group of cavities has a third shape, [REDACTED] wherein the first, second, and third shapes are all different, [REDACTED] and wherein each of the cavities has a single opening.

31. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defining at least a first, a second, and a third group, wherein a first group of cavities has a first size, a second group of cavities has a second size, a third group of cavities has a third size, [REDACTED] wherein the first, second, and third sizes are all different, [REDACTED] and wherein each of the cavities has a single opening.

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32. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a plurality of cavities defined by substantially distinct and discernible boundaries which include substantially specific dimensions, wherein a first cavity has specific first dimensions, a second cavity has specific second dimensions, and a third cavity has specific third dimensions, each of said cavities has a boundary defined by at least four planar surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein at least one angle of intersection of said first cavity is different from all the angles of intersection of said second and third cavities, [redacted] wherein at least one angle of intersection of said second cavity is different from all the angles of intersection of said first and third cavities [redacted]

56. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, and the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second and third plurality of angles, [redacted] wherein at least one of the angles of the second plurality is different from all of the angles of the first and third plurality of angles [redacted]; and

forming the production tool using the design.

57. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of

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cavities each have a first geometric shape and first plurality of angles forming the geometric shape, the second plurality of cavities each have a second geometric shape and second plurality of angles forming the geometric shape, the third plurality of cavities each have a third geometric shape and third plurality of angles forming the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape and fourth plurality of angles forming the geometric shape, wherein at least one of the angles of the first plurality is different from all of the angles of the second, third, and fourth plurality of angles, wherein at least one of the angles of the second plurality is different from all of the angles of the first, third, and fourth plurality of angles, [REDACTED] wherein at least one of the angles of the third plurality is different from all of the angles of the first, second, and fourth plurality of angles [REDACTED] and wherein at least one of the angles of the fourth plurality is different from all of the angles of the first, second, and third plurality of angles [REDACTED]; and

forming the production tool using the design.

**63. (Amended) A method of making a production tool, the method comprising:**

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a plurality of cavities defining at least a first, a second group, and a third group, wherein a first group of cavities has a first shape, a second group of cavities has a second shape, a third group of cavities has a third shape, [REDACTED] wherein the first, second, and third shapes are all different [REDACTED] and wherein at least one of the shapes is a multi-angle shape; and

forming the production tool using the design.

**64. (Amended) A method of making a production tool, the method comprising:**

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a plurality of cavities defining at least a first, a second group, and a third group, wherein

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a first group of cavities has a first size, a second group of cavities has a second size, a third group of cavities has a third size, [REDACTED] wherein the first, second, and third sizes are all different [REDACTED]

[REDACTED] ; and

forming the production tool using the design.

89. The production tool of claim 23, wherein the first geometric shape includes a base and first plurality of base edge lengths, wherein the second geometric shape includes a base and second plurality of base edge lengths, wherein the third geometric shape includes a base and third plurality of base edge lengths, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, and wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths.

90. The production tool of claim 24, wherein the first geometric shape includes a base and first plurality of base edge lengths, wherein the second geometric shape includes a base and second plurality of base edge lengths, wherein the third geometric shape includes a base and third plurality of base edge lengths, wherein the fourth geometric shape includes a base and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, and wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths.

92. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each

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have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, and the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, [redacted] wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths [redacted] and wherein each of the cavities has a [redacted]

93. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape including a base and fourth plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, [redacted] wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, [redacted] wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths [redacted] and wherein each of the cavities has a [redacted] single opening.

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**113. (Amended) A method of making a production tool, the method comprising:**

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, and third plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, and the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, [REDACTED] wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths [REDACTED]; and

forming the production tool using the design.

**114. (Amended) A method of making a production tool, the method comprising:**

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, third, and fourth plurality of cavities, wherein the first plurality of cavities each have a first geometric shape including a base and first plurality of base edge lengths forming the base of the geometric shape, the second plurality of cavities each have a second geometric shape including a base and second plurality of base edge lengths forming the base of the geometric shape, the third plurality of cavities each have a third geometric shape including a base and third plurality of base edge lengths forming the base of the geometric shape, and the fourth plurality of cavities each have a fourth geometric shape including a base and fourth plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all

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of the base edge lengths of the first, third, and fourth plurality of base edge lengths, [REDACTED] wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths [REDACTED] and wherein the first, second, and third plurality of base edge lengths [REDACTED]; and

forming the production tool using the design.

133. The production tool of claim 92, wherein at least one of the base edge lengths of the third plurality of base edge lengths is different from all the base edge lengths of the first and second plurality of base edge lengths.

134. The production tool of claim 92, wherein the first, second, and third geometric shapes are pyramidal.

135. The production tool of claim 92, wherein the first, second, and third geometric shapes are truncated pyramidal.

136. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising a first, second, and third row of cavities, wherein the cavities each have a geometric shape including a base and a plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first row of cavities is different from all the base edge lengths of the second and third rows of cavities, [REDACTED] wherein at least one of the base edge lengths of the second row of cavities is different from all the base edge lengths of the first and third row of cavities [REDACTED] and wherein the first, second, and third row of cavities has a single opening.

137. The production tool of claim 136, wherein at least one of the base edge lengths of the third row of cavities is different from all the base edge lengths of the first and second row of cavities.

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138. The production tool of claim 136, wherein the geometric shape of the cavities in the first, second, and third rows are pyramidal.

139. The production tool of claim 136, wherein the geometric shape of the cavities in the first, second, and third rows are truncated pyramidal.

140. The production tool of claim 136, wherein the first, second, and third rows of cavities extend in parallel to one another.

141. The production tool of claim 136, wherein the base edge lengths of the first row of cavities have a first base edge length extending parallel to the first row and a second base edge length extending perpendicular to the first row, and wherein the second base length of all the cavities in the first row is the same.

142. The production tool of claim 141, wherein at least some of the first base lengths of the cavities in the first row are different from one another.

143. (Amended) A production tool suitable for use in manufacturing an abrasive article comprising first, second, and third cavities, wherein the first cavity has a first geometric shape including a base and a first plurality of base edge lengths forming the base of the geometric shape, the second cavity has a second geometric shape including a base and a second plurality of base edge lengths forming the base of the geometric shape, and the third cavity has a third geometric shape including a base and a third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality of base edge lengths is different from all the base edge lengths of the second and third plurality of base edge lengths, [and] wherein at

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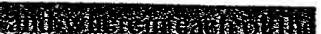
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least one of the base edge lengths of the second plurality of base edge lengths is different from all the base edge lengths of the first and third plurality of base edge lengths.   


144. The production tool of claim 143, wherein at least one of the base edge lengths of the third plurality of base edge lengths is different from all the base edge lengths of the first and second plurality of base edge lengths.

145. The production tool of claim 143, wherein the geometric shapes of the first, second, and third cavities are pyramidal.

146. The production tool of claim 143, wherein the geometric shapes of the first, second, and third cavities are truncated pyramidal.

147. The production tool of claim 143, wherein the first cavity is located adjacent to the second cavity.

148. The production tool of claim 147, wherein the second cavity is located adjacent to the third cavity.

149. The method claim of 56, wherein the first geometric shape includes a base and first plurality of base edge lengths, wherein the second geometric shape includes a base and second plurality of base edge lengths, wherein the third geometric shape includes a base and third plurality of base edge lengths, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second and third plurality of base edge lengths, and wherein at least one of

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the base edge lengths of the second plurality is different from all of the base edge lengths of the first and third plurality of base edge lengths.

150. The method claim of 57, wherein the first geometric shape includes a base and first plurality of base edge lengths, wherein the second geometric shape includes a base and second plurality of base edge lengths, wherein the third geometric shape includes a base and third plurality of base edge lengths, wherein the fourth geometric shape includes a base and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the first plurality is different from all of the base edge lengths of the second, third, and fourth plurality of base edge lengths, wherein at least one of the base edge lengths of the second plurality is different from all of the base edge lengths of the first, third, and fourth plurality of base edge lengths, and wherein at least one of the base edge lengths of the third plurality is different from all of the base edge lengths of the first, second, and fourth plurality of base edge lengths.

151. (Amended) A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a plurality of cavities defined by substantially distinct and discernible boundaries which include substantially specific dimensions, wherein a first cavity has specific first dimensions, a second cavity has specific second dimensions, and a third cavity has specific third dimensions, each of said cavities has a boundary defined by at least four planar surfaces wherein adjacent planar surfaces of one cavity meet at an edge to define an angle of intersection therebetween, wherein at least one angle of intersection of said first cavity is different from all the angles of intersection of said second and third cavities, [ ] wherein at least one angle of intersection of said second cavity is different from all the angles of intersection of said first and third cavities, [ ]

[ ] cavity has a single opening; and

forming the production tool using the design.

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152. **(Amended)** A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising a first, second, and third row of cavities, wherein the cavities each have a geometric shape including a base and a plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first row of cavities is different from all the base edge lengths of the second and third rows of cavities, [REDACTED] wherein at least one of the base edge lengths of the second row of cavities is different from all the base edge lengths of the first and third row of cavities [REDACTED]; and

forming the production tool using the design.

153. **(Amended)** A method of making a production tool, the method comprising:

creating a design for a production tool for manufacturing an abrasive article, the production tool comprising first, second, and third cavities, wherein the first cavity has a first geometric shape including a base and a first plurality of base edge lengths forming the base of the geometric shape, the second cavity has a second geometric shape including a base and a second plurality of base edge lengths forming the base of the geometric shape, and the third cavity has a third geometric shape including a base and a third plurality of base edge lengths forming the base of the geometric shape, wherein at least one of the base edge lengths of the first plurality of base edge lengths is different from all the base edge lengths of the second and third plurality of base edge lengths, [REDACTED] wherein at least one of the base edge lengths of the second plurality of base edge lengths is different from all the base edge lengths of the first and third plurality of base edge lengths [REDACTED]; and

[REDACTED] has a single opening; and

forming the production tool using the design.